

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
15 July 2004 (15.07.2004)

PCT

(10) International Publication Number  
**WO 2004/059395 A3**

(51) International Patent Classification<sup>7</sup>: **G03F 7/20,**  
G01M 11/02

[NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven  
(NL). **JUFFERMANS, Casparus, A., H.** [NL/NL]; c/o  
Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(21) International Application Number:  
PCT/IB2003/006142

(74) Agent: **DUIJVESTIJN, Adrianus, J.;** Philips Intellectual  
Property & Standards, Prof. Holstlaan 6, NL-5656 AA  
Eindhoven (NL).

(22) International Filing Date:  
18 December 2003 (18.12.2003)

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR,  
CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD,  
GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,  
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,  
MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU,  
SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,  
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
02080544.6 30 December 2002 (30.12.2002) EP

(84) Designated States (*regional*): ARIPO patent (BW, GH,  
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,  
SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

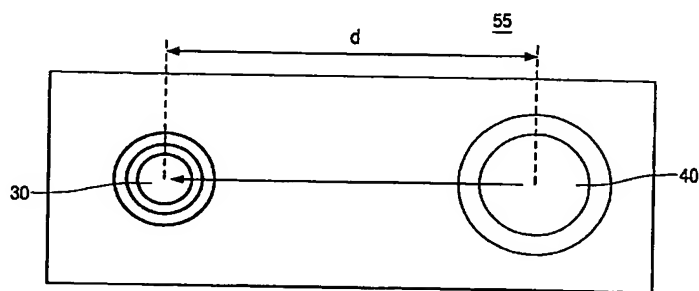
(71) Applicant (*for all designated States except US*): **KONIN-  
KLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL];  
Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventors; and

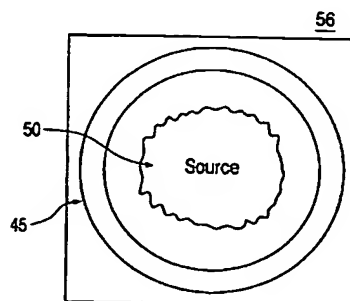
(75) Inventors/Applicants (*for US only*): **DIRKSEN, Peter**

[Continued on next page]

(54) Title: METHOD OF MEASURING THE PERFORMANCE OF AN ILLUMINATION SYSTEM



A



B

(57) Abstract: The performance of an illumination system in, for example, a lithographic projection apparatus can be measured accurately and reliably by means of a test object (55) comprising at least one Fresnel zone lens (30) and an associated reference mark, preferably a ring (40). By superposed imaging of these and detecting and evaluating the composed image (56), telecentricity errors and aberrations of the illumination can be measured.

**Declaration under Rule 4.17:**

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT,

LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

**Published:**

- with international search report

(88) Date of publication of the international search report:

17 March 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IB 03/06142

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G03F7/20 G01M11/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 G03F G01M H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, INSPEC, IBM-TDB

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	WO 03/056392 A (JUFFERMANS CASPARUS A H ; DIRKSEN PETER; JANSSEN AUGUSTUS J E M) 10 July 2003 (2003-07-10) cited in the application claims 24-29	23-28, 39
X	US 4 585 342 A (TAUR YUAN ET AL) 29 April 1986 (1986-04-29) column 2, line 58 - column 6, line 11 figures	23-28, 39
X	US 6 048 651 A (BRUNNER TIMOTHY A ET AL) 11 April 2000 (2000-04-11) cited in the application column 1, line 21 - line 28 column 2, line 66 - column 5, line 65 figures	39
A		1, 14, 29, 37, 38

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*Z\* document member of the same patent family

Date of the actual completion of the international search

16 December 2004

Date of mailing of the international search report

30/12/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Heryet, C

# INTERNATIONAL SEARCH REPORT

International Patent Application No  
PCT/IB 03/06142

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 03056392	A	10-07-2003	EP 1461666 A1 WO 03056392 A1	29-09-2004 10-07-2003
US 4585342	A	29-04-1986	DE 3582197 D1 EP 0170013 A2 JP 2103812 C JP 3003374 B JP 61015328 A	25-04-1991 05-02-1986 06-11-1996 18-01-1991 23-01-1986
US 6048651	A	11-04-2000	KR 2000029247 A	25-05-2000